

How does Extreme Temperature Affect Cells?

Standard Statement:

3.3 B- Describe and explain the chemical and chemical basis of living organisms.

3.4.7 A- Describe concepts about the structure and properties of matter.

Content Objectives:

Students will be able to:

1. Identify the affect of extreme temperature change on living cells.
2. Discuss the problems astronauts face while in space relating to extreme temperature variation.
3. Use proper microscope techniques.
4. Discuss how astronauts overcome extreme temperature variations in the space environment.

Process Objectives:

Students will be able to:

1. Prepare microscope slides and focus using the coarse and fine objectives.
2. Draw Samples seen on the microscope slide for comparison.
3. Analyze data collected in an oral presentation.
4. Create a visual aid to be used during the presentation.

Assessment Strategies:

1. Collection of data in the form of visual observations and drawings.
2. Analysis of data collection in an oral presentation using a visual aid.

Procedures:

1. Discuss with students the extreme temperature variation encountered in space due to the lack of atmosphere.
2. Complete the following investigation.

Suggested Level:

Intermediate/Secondary

Standard Category:

3.4-Physical Science,
Chemistry and Physics
3.3-Biology Sciences

Materials:

3 onions
Microscope
Tweezers
Microscope slides
Cover slips

Instructional Strategies:

Experimentation
Cooperative learning
Research
Essay writing
Interpreting data

Related Concepts:

Artistic presentation
Understanding the space environment

How Does Extreme Temperature Affect Cells?

Thought question to begin:

What compound makes up 75% of your body? _____

Investigation:

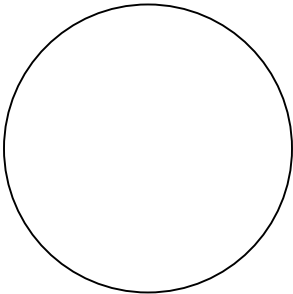
Complete the following investigation to understand the affect of extreme temperature on living cells? Follow the following instructions carefully!

1. On the day before the investigation place one of the onions in the freezer. On the day of the investigation, take the onion out of the freezer and allow it to thaw.
2. Place the other onion in the microwave until it is cooked (approximately 2 minutes) and allow it to cool.
3. Slice each onion into strips lengthwise along the grain to create banana shaped pieces. Observe the texture of the three onions. Record your observations in the data table.
4. Using the tweezers, peel the clear, thin, outer layer of skin from the onion and place it on the microscope slide. Place a drop or two of stain on the onion.
5. Place a cover slip over the onion and place it on the stage of the microscope.
6. Focus on the onion slide under the scanning objective lens (4X).
7. Draw the image that you see under the microscope.
8. Repeat steps 3 through 7 using the cooked and defrosted onion pieces.

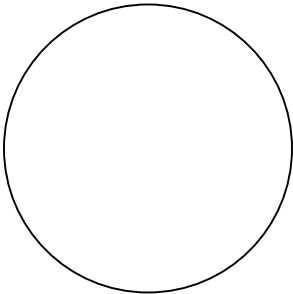
Data Table

<i>Onion</i>	<i>Texture</i>
<i>Defrosted</i>	
<i>Cooked</i>	
<i>Standard</i>	

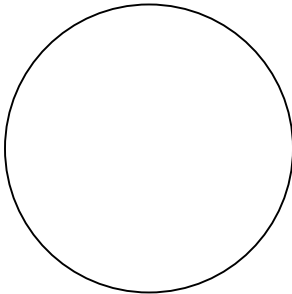
Draw slides below:



Standard



Cooked



Defrosted

Questions to ponder:

1. What parts of a plant cell are visible under the microscope?
2. What is the function of the cell wall in the plant cell?
3. Do animal cells have cell walls?
4. Are there any differences in the visual appearances of the three cells? If so please describe them.
5. Of what compound is the majority of the cell composed?
6. Does ice sink or float when it is placed in water?
7. What causes this to happen?
8. Is ice more or less dense than liquid water?
9. What happens to the cell membrane and the vacuoles in a cell as water freezes and takes up more space?
10. What might happen to an animal cell if it were exposed to extreme hot or cold temperatures?
11. What are the implications of these results for astronauts in space?

Follow up activity:

Give an oral presentation about the results of your experiment. Create a visual aid that incorporates the results of your experiment and the information you learned from this lab.

Oral Presentation in Science

Name _____ Date _____ Course/Class _____

Task/Assignment _____

Performance Criteria		Assessment			
		Points	Self	Teacher	Other(s)
Content and Organization					
1.	The purpose of the presentation (informing, persuading or both), the subject, and any position taken by the presenter are clearly defined at the outset.				
2.	The presentation is made in an interesting, logical sequence – an introduction, an organized body, and a clear closure – that the audience can follow.				
3.	The introduction has a strong purpose statement that serves to captivate the audience and narrow the topic.				
4.	An abundance of accurate supporting scientific concepts, facts, figures, statistics, scenarios, stories, and analogies are used to support the key points and ideas.				
5.	The vocabulary is appropriate to both the science content and the audience.				
Optional					
6.	Interesting and colorful audiovisuals aids or multimedia materials are interwoven to explain and reinforce the screen text and presentation.				
7.	The topic is developed completely and thoroughly.				

Oral Presentation in Science (continued)

Performance Criteria		Assessment			
		Points	Self	Teacher	Other(s)
Presentation					
8.	The speaker maintains a proper volume, clear elocution, steady rate, effective inflections and enthusiasm throughout the presentation.				
9.	Humor is used positively and in good taste, with consideration given to the composition of the audience.				
10.	Stories and motivational scenarios are used appropriately.				
11.	Body language such as eye contact, posture, gestures, and body movements are appropriate and are used to create effect.				
12.	Delivery is well paced, flows naturally, has good transitions, and is coherent.				
13.	The speaker is relaxed, self-confident and appropriately dressed for purpose or audience.				
Audience					
14.	The audience's attention is maintained by involving them in the presentation.				
15.	Information needed by audience to fully understand the presentation is provided.				
16.	The speaker gives the audience time to think, reflect, and ask questions about points made in the presentation.				
17.	The speaker answers all questions with clear explanations and further elaborations.				

Oral Presentation in Science (continued)

Performance Criteria

18. The topic and the length of the presentation is appropriate for the audience and within the allotted time limits.

Assessment			
Points	Self	Teacher	Other(s)

O Comments	O Goals	O Actions

Scientific Drawing

Name _____ Date _____ Course/Class _____

Task/Assignment _____

Expert 4	The drawing(s) realistically and effectively depicts the object(s). Multiple perspectives are provided to enhance understanding. A descriptive and accurate title is provided and all the parts of the drawing are clearly labeled. A detailed, written explanation of what the scientific drawing is intended to show is included, along with a key or legend to further explain the drawing(s). The drawing(s) is of an appropriate size and consistent metric scale for details to be easily recognized. . Principles of artistic composition are well employed.
Proficient 3	The drawing(s) depicts the object(s). Many details are included. A descriptive and accurate title is provided and most parts of the drawing are clearly and neatly labeled. A sketchy, written explanation of what the scientific drawing is intended to show is included. The drawing(s) is of an appropriate size and scale for details to be easily recognized. Principles of artistic composition are employed.
Emergent 2	The drawing(s) reasonably depicts the object(s). The drawing(s) is a reasonable rendition of the object(s), but may include features that were not actually observed. Some details are included. Only one perspective of the object(s) is provided. A title is provided for the drawing(s). Some parts of the scientific drawing are labeled. Labeling lacks neatness, legibility, and attractiveness. A sketchy, written explanation of what the scientific drawing is intended to show is included. The drawing(s) is inappropriately sized and scaled. Principles of artistic composition are largely lacking in this drawing(s).
Novice 1	The drawings are clearly lacking in realism, accuracy, and detail. It is difficult to tell what the drawing(s) represents. Scale and proportion are clearly lacking. Metric measurements are missing. Few distinguishing forms, structures, and details are labeled. Labeling is not consistently neat, legible, and attractive. No attempt is made to provide a title of the drawing(s). The principles of artistic composition are lacking in this drawing.

<input type="checkbox"/> Comments	<input type="checkbox"/> Goals	<input type="checkbox"/> Actions
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Scientific Investigation

Name _____ Date _____ Course/Class _____

Task/Assignment _____

Expert 4	The question has been developed in such a way that it can be answered by conducting an experiment and reflects background research and previous observations. The hypothesis has been developed directly from the question and is expertly expressed in an “If-and-then” statement(s). The procedures are detailed, complete, follow a logical step by step order, and include a list of all necessary materials. The experimental design uses proper controls and tests for the effects of only one independent variable at a time. The collected data are organized and displayed in appropriate graphic formats. The data are manipulated through the use of appropriate statistical methods. The conclusions of the experiment are written in clear and complete statements, and are supported by the data. Language used is appropriate, purposeful, and written in complete sentences. Scientific content and terminology are accurate.
Proficient 3	The question provides general guidance to the design of an experiment. The hypothesis has been developed from the question and is expressed in an “If-and-then” statement(s). The procedures are complete, follow a somewhat logical step by step order, and include a list of materials. The experimental design uses proper controls and tests for the effects of only one independent variable at a time. The collected data are organized, displayed, and manipulated through the use of appropriate statistical methods. The conclusions of the experiment are written in clear and complete statements, and are mostly supported by the data. Language used is appropriate and purposeful. Scientific content and terminology may contain minor errors.
Emergent 2	The question provides some guidance to the design of an experiment. The hypothesis is loosely connected to the question and there is an attempt to express it in an “If-and-then” statement(s). The procedures are incomplete and follow a somewhat illogical step by step order. The experimental design does not completely identify nor control variables. The collected data are disorganized and there is limited manipulation through the use of appropriate statistical methods. The conclusions of the experiment are loosely supported by the data. Much of the language used is inappropriate. Scientific content and terminology contains major errors.
Novice 1	The question is ill defined and gives little to no direction for developing an experiment. The hypothesis bears little to no connection to the question. The design of the experiment is unclear. The procedures are confusing and difficult to follow. Variables have not been clearly identified, nor controlled. The conclusions of the experiment are vague, not written in clear and complete statements, and are not supported by the data.

O Comments	O Goals	O Actions
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